CHAPTER VII

VII. PHOSPHORUS BUDGET

A. Development of Phosphorus Budgets

The calculation of a phosphorus budget is an essential step in the evaluation of a lake's trophic status. A phosphorus budget provides a means to evaluate and rank phosphorus sources that may contribute to algal problems. It is most important to realize the quantity of nutrients (especially phosphorus) entering the lake, as well as the ultimate fate of those nutrients. The phosphorus budget relies heavily upon the accuracy of the hydrologic budget for its input and output variables.

Many extensive nutrient budgets have been reported in the literature. Lake Washington in Seattle, Washington (Edmondson, 1968), Lake Erie (Burns, 1976), and Kezar Lake, North Sutton, New Hampshire (Connor, 1983) have been studied in great detail.

Nutrient loading rates have been reported as either "surface loading rates" or "volumetric loading rates" and are usually expressed in terms of mass per unit area-time, and mass per unit volume-time.

The purpose of this chapter is to quantify the various avenues of phosphorus inputs into Sucker Brook and Webster Lake and to explore the various phosphorus sinks and exports from the watershed. Phosphorus loadings (flux) were calculated for tributary inflow to Sucker Brook. A phosphorus budget was then prepared for a normalized year and for the 1988 study year.

B. Phosphorus Budget Components

1. Tributary loading and discharge

Tributary phosphorus concentrations were analyzed and monthly loadings were calculated for each of the Sucker Brook stations. Sucker Brook phosphorus loading to Webster Lake was tabulated during the twelve month study period. Phosphorus loadings were determined by calculating mean monthly tributary flows (10^3m^3) and multiplying these values by mean monthly phosphorus concentrations (mg/L). The resultant values represent mean monthly phosphorus loading or flux (Kg P). The summations of each of the calculated monthly values equals the total tributary and outlet annual phosphorus loading.

Because the main emphasis of this project was the impact of Sucker Brook phosphorus loading to Webster Lake, none of the remaining tributaries to the lake were sampled. However, a phosphorus budget was prepared by utilizing phosphorus concentrations collected during the 1979-1980 study period (Dufresne-Henry and WS&PCC, 1981).

2. Atmospheric

Atmospheric inputs consist of two major components: (1) wind transported material, commonly referred to as dryfall, removed from the air by sedimentation or impaction; and (2) soluble gases or salts that are scavenged by rainfall. Estimates for the dryfall portion alone may be as high as 70-90 percent of the total atmospheric load (Likens and Loucks, 1978).

In agrarian areas, increases in nutrient loads transported via the atmosphere can be attributed to agricultural activities and associated soil disturbances. Urban atmospheric inputs of nutrients can be attributed primarily to combustion emissions.

Atmospheric phosphorus loading (wetfall and dryfall) for Webster Lake was determined by the direct measurement of phosphorus in rain samples collected in Concord, New Hampshire and from rainfall and export coefficients (Reckhow, et al, 1980).

3. Direct Surface Runoff

Direct surface runoff includes the water and its transported phosphorus that does not enter a lake via tributary or groundwater. Direct surface runoff is the result of near shore snowmelt and rainfall, especially during high intensity storms.

Loadings in runoff from shoreline areas can be estimated indirectly. In many cases, indirect estimates of loading from an area can be derived from information on watershed characteristics. This method is based upon the concept that two watersheds in the same region and with similar land use patterns and geology will tend to contribute the same loading of phosphorus per unit area. This permits extrapolation of data from one or more monitored watersheds to others.

4. Septic Leachate

Septic tanks and leachfields are another non-point source that must be considered as a nutrient source, because of their potential for nutrient enrichment of the groundwater which flows into a lake.

Several studies (e.g., Jones and Lee, 1977; NHWS&PCC, 1975) have indicated that a properly designed, constructed, and maintained system will not generally contribute significant amounts of phosphorus to surface waters or cause extensive fertilization. However, because of their use in unsuitable areas or because of improper design, construction, or maintenance, it is estimated that over one-half of the systems in use today fail before their designed life of fifteen to twenty years is completed (Scalf et al., 1977).

The most common type of individual disposal system is the septic tank-leach field system. The tank functions to separate the solids, both floating and settleable, from the liquid material. The accumulated sludge should be pumped out every three to five years. The liquid is discharged from the tank through piping material and distributed over the leaching area, which is designed to absorb the effluent and to remove the impurities before it percolates to the groundwater.

In 1967, the New Hampshire legislature enacted a law to protect water supplies from pollution by subsurface disposal systems, and directed the Water Supply and Pollution Control Division to establish minimum, state-wide requirements for properly designed systems. The requirements most pertinent to the prevention of surface water contamination by phosphorus are:

1. Location of the system with respect to the surface water body,
2. Soil permeability: the rate of water transmission through saturated soil, of which estimated soil retention coefficients varied with different lake sections,
3. Land slope: steep slopes may cause erosion problems when associated with low permeability soils,
4. System age: soils have only a finite capacity for phosphorus absorption,
5. Per capita occupancy: (household population based on sanitary survey),
6. Fraction of year system is in use: (i.e., summer cottages or year-round dwellings), and
7. Additional water utilizing machinery: (i.e., washing machines, dish washers, or garbage disposals).

A survey of individual sanitary waste-disposal systems around Webster Lake was conducted by the Water Supply and Pollution Control Commission during July of 1980. The survey consisted of a visual inspection of the property, interviews with residents to discuss various problems, and the compilation of certain statistical information regarding the system, such as type of system, age, maintenance schedule, depth to groundwater, etc. A copy of the form used during the survey is included in Appendix VII-1.

The sanitary survey attempted to include all homes with direct access to the lake, referred to as first tier, and some back lot homes, referred to as second tier. A random number of homes on Robin and Oriole Streets were surveyed to get an idea of the type and condition of disposal systems in that area. These systems all appeared to be functioning satisfactorily, and had sufficient depth to groundwater to reduce phosphorus loading to the lake. Ninety-six of the approximately 147 first tier dwellings, and 30 of the second tier dwellings were surveyed.

The information from the sanitary survey is shown in Appendix VII-1. At that time, about 50 percent of the systems checked were between 10 and 20 years old, and most consisted of some form of septic tank and leaching system. Of the systems checked, about 47 were less than 50 feet from the lake, approximately 42 were located less than 4 feet above the seasonal high groundwater table, and 16 were less than 2 feet from the groundwater table. Approximately 65 percent of the first tier dwellings are used only seasonally, which is significant, as this tends to reduce the loading on the soils and subsequently to the lake.

The soils around the lake ranged from having slight to severe limitations for subsurface disposal. Much of the lakefront property, however, appears to be on filled areas.

Of all the dwellings surveyed, there were only two systems that were observed with effluent breaking out at the ground surface. The term "failure," for the purpose of this report, is considered to mean an inability of the soils to adequately remove phosphorus. Using this definition, and the information from the sanitary survey, there would be two failures and 16 potential failures in the area. Potential failures are defined as areas where physical characteristics have limited the capacity of the soils to remove phosphorus. These potential failures have been identified as any subsurface disposal system installed less than two feet above the water table.

The State of New Hampshire requires that there be a vertical distance of four feet from the bottom of the leachfield and the seasonal high water table. Additionally, a lateral separation of 75 feet between the leachfield and any surface water is required.

From the sanitary survey it is evident that any problems caused to the lake are a result of phosphorus loading through saturated soils, and not by direct runoff failures.

Therefore, it appears that while the present systems do not necessarily constitute health hazards, they are probably contributing a phosphorus load to the lake. This is significant, as it has been determined that the lake is phosphorus limited. In most cases, the first tier lots would not be of sufficient size for construction of subsurface disposal systems that would meet present State standards.

Calculations of phosphorus contributions from shoreline homes and cottages are outlined in Appendix VII-2. Seasonal loading is differentiated from year-round loading and then further divided based on failure or nonfailure.

A survey of Sucker Brook point and non-point discharges, revealed three direct discharges of sewer systems into Sucker Brook. Each of these discharges were reported for enforcement action. At the time of this report, all three of the direct discharges to Sucker Brook had been cited for non-compliance. Two of the discharges have been discontinued and the owners have installed state inspected septic systems. Enforcement action is still being pursued in the third discharge.

5. Groundwater

Relatively little is known of groundwater seepage nutrient concentrations and their importance to nutrient budgets. Lee (1977) first applied the direct seepage meter technique in Lake Sallie, Minnesota, in an attempt to monitor the contribution of nutrients from septic tanks located around the lake. He concluded that all septic tank phosphorus appeared to be bound to the soil, but that 40 percent of the nitrogen from the septic tanks entered the lake. In the past, well-water along the lake's boundary was analyzed for an estimate of nutrient input via seepage. The utilization of this type of methodology, however, does not account for nutrient concentration differences within the water table profile and does not include sediment interactions with seepage water (Connor, 1979).

Because of the budget limitations of this project, no groundwater nutrient analyses were conducted at Webster Lake. This made it difficult to adequately estimate groundwater nutrient flux into the waterbody.

6. Sediment Release-Uptake

The fate of phosphorus in water is usually considered to consist of: (1) chemical, physical, or biological transformation of the ionic form into a particle; (2) sedimentation of this particle to the bottom; (3) particle breakdown in the sediment; and (4) the release of some of the ionic phosphorus back into the lake water if conditions are favorable.

The actual measurement of total phosphorus release or uptake from the sediment is an impractical task to attempt. Since sediment release and uptake are simultaneously occurring in different sections of a lake, and other chemical, physical and biological activities are also occurring, it is virtually impossible to establish a realistic total phosphorus release or uptake figure. However, an estimation of net differences between total uptake and total release can be derived by calculating an internal phosphorus loading model. A positive mass balance solution represents net phosphorus release (loading) and a negative solution represents net uptake.

C. Sucker Brook Phosphorus Budget for Study Period (1988)

1. Gaging Year Phosphorus Budget

A valid phosphorus budget is dependent upon a well quantified hydrologic budget and is essential to the calculation of phosphorus loading. An accurate phosphorus budget is important when modeling the lake's tolerance to inflowing phosphorus.

The gaging year phosphorus budget of Sucker Brook, via each subwatershed tributary, provides important information valuable in determining the relative phosphorus contributions from each tributary. Once the budget is completed, areas of high phosphorus loading can be targeted for phosphorus abatement programs.

Phosphorus loading was derived from a period of time between January and December, 1988. Monthly phosphorus loading to Sucker Brook from each of the monitored tributaries is presented in Table VII-1. The only significant change of phosphorus loading between tributary loading and actual Webster Lake loading occurs in April when an excess of 68 Kg of phosphorus entered Webster Lake from unmonitored or other sources. These sources are from seasonal tributaries that only run during spring snowmelt and storm events.

Table VII-2 reflects phosphorus loading for those stations located on Sucker Brook. As expected, the phosphorus load within the brook increases

Table VII-1
Gaging Year Phosphorus Budget
Sucker Brook (January, 1988 to December, 1988)
Tributary Phosphorus Loading (KgP)

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean Monthly	Total Annual
1. Highland Lake Outlet	4.5	3.0	4.3	18.8	8.8	5.2	8.2	2.4	6.6	10.4	1.9	6.7	6.7	80.8
2. Three Brooks	1.7	1.6	2.4	2.0	4.2	1.2	2.3	0.8	0.6	low flow	1.6	0.8	1.6	19.2
3. Cilley Hill	0.2	0.2	0.5	1.5	0.3	0.1	0.8	0.1	0.04	0.02	0.6	0.7	0.4	5.1
4. Emory Pond	2.0	18.3	4.8	30.5	4.2	0.5	2.9	1.0	0.4	0.2	2.7	2.0	5.8	69.5
5. Bald Hill	6.2	0.3	0.2	2.7	0.6	0.3	1.0	0.2	0.2	0.1	0.4	1.6	1.2	13.8
6. Apple Farm	0.2	0.3	0.4	1.1	0.3	0.1	0.03	0.02	0.01	0.01	0.1	0.3	0.2	2.9
7.														
Total Influx	14.8	23.7	12.6	56.6	18.4	7.4	15.2	4.5	7.9	10.7	7.3	12.1	15.9	191.2
Total Outflux to Webster Lake	15.9	22.5	15.4	124.5	26.9	6.0	19.3	4.2	6.1	2.9	9.0	12.8	22.1	265.5
Net P Flux (+) Uptake (-)	+1.1	-1.2	+2.8	+67.9	+8.5	-1.4	+4.1	-0.3	-1.8	-7.8	+1.7	+0.7	+6.2	+74.3

Table VII-2
Gaging Year Phosphorus Budget
Sucker Brook Phosphorus Distribution (Kg p)

Source	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean Monthly	Total Annual
1. Highland Lake Outlet	4.5	3.0	4.3	18.8	8.8	5.2	8.2	2.4	6.6	10.4	1.9	6.7	6.7	80.8
2. Three Brooks Sucker Station	5.3	4.2	8.2	18.9	14.9	6.1	14.4	2.7	5.0	0.4	1.9	6.0	7.3	88.0
3. Dyers Crossing	5.8	28.9	11.6	45.0	22.3	6.3	33.4	5.3	8.4	1.0	6.0	11.0	15.4	185.0
4. Reep Farm	20.6	14.6	14.0	58.8	25.0	11.2	25.2	6.7	7.3	2.7	10.1	14.1	17.5	210.3
5. Webster Inlet	15.9	22.4	15.4	124.5	26.9	6.0	19.3	4.2	6.1	2.9	9.0	12.8	22.1	265.4

with distance. The total annual load increased from 81 Kg at the Highland Lake Outlet to 265 Kg at the Webster Lake Inlet. The greatest increase of loading occurred between the Three Brooks station and the Dyers Crossing station.

Figure VII-1 demonstrates that the maximum phosphorus loading from Sucker Brook to Webster Lake occurred during April and May of 1988. Forty-seven percent of the total phosphorus loading entered during April and May for the gaging year. It is this period of time from March through May that winter snowmelt and spring rainfall create the highest flows of the year. The meltwater and rainfall not only increase the surface runoff but also strip away the phosphorus that has accumulated throughout the winter months. This phosphorus rich surface runoff flows over the frozen ground, avoiding infiltration, and enters Sucker Brook.

The least phosphorus contribution to the lake from Sucker Brook was measured from August through November when only eight percent of the total annual phosphorus load entered Webster Lake. These minimum phosphorus loadings are attributed to low rainfall and more precipitation entering the hydrologic system as groundwater rather than surface water runoff.

Figure VII-2 demonstrates the total annual phosphorus load to Sucker Brook from each measured inflowing tributary and unmonitored sites. Highland outlet was the greatest phosphorus contributor to Sucker Brook. Thirty percent (81 Kg) of the total phosphorus loading to Sucker Brook was derived from Highland Lake.

Unmonitored sources were responsible for 28 percent (74 Kg P) of the phosphorus loading to Sucker Brook. Almost 92 percent of this unmonitored phosphorus source occurred during the month of April. This loading was attributed to seasonal tributaries that flow only during snowmelt and high intensity rain events. Other contributing sources of phosphorus that were not directly monitored included groundwater seepage and surface runoff.

The third highest contributor of phosphorus to Sucker Brook was Emory Pond Brook. This brook did not have a high hydrologic volume but consistently contained a high concentration of phosphorus. Emory Pond Brook contributed 26 percent (70 Kg P) of the total phosphorus loading to Sucker Brook during the gaging year. The Emory Brook drainage basin includes a large dairy farm that prior to 1989, did not utilize best management practices. Much of the waste products from this dairy was stored outside, uncovered. Surface runoff from this area carried high phosphorus concentrations into Emory Brook and ultimately into the water and sediment of Webster Lake.

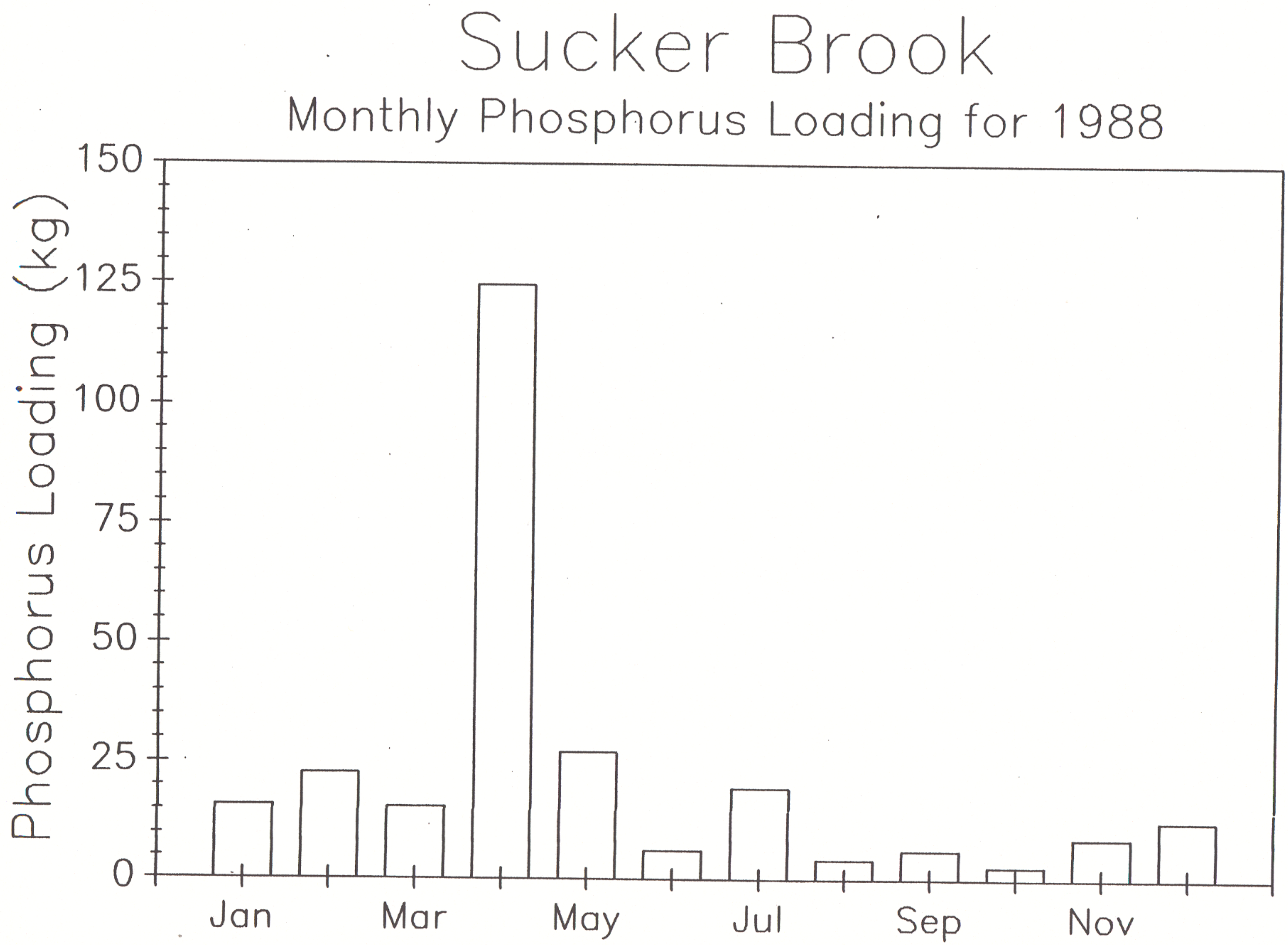

Figure VII-1. Sucker Brook Total Phosphorus Loading to Webster Lake.

Total Annual Phosphorus Loading to Sucker Brook

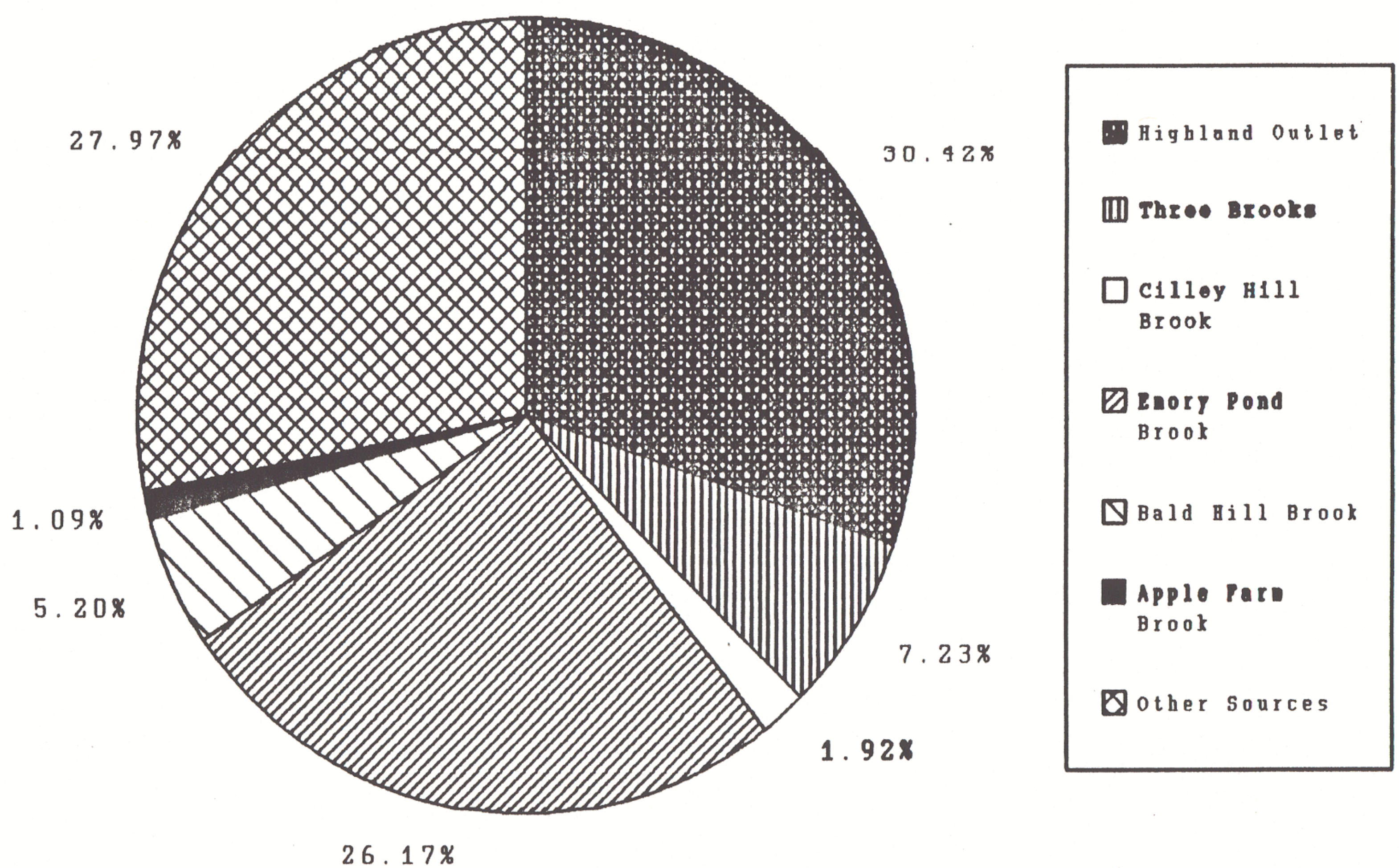

Figure VII-2.

Lesser amounts of phosphorus loading were measured in the Three Brooks station which contributed 7 percent (19 Kg P) of the phosphorus loading and Bald Hill Brook which contributed 5 percent (14 Kg P) of the total load to Sucker Brook.

Stations that had little impact of phosphorus loading to Sucker Brook included Cilley Hill Brook that yielded almost two percent (5 Kg P) of the load and Apple Farm Brook which represented only one percent (3 Kg P) of the phosphorus load to Sucker Brook.

2. Storm Event Phosphorus Loading to Sucker Brook

Storm events can be a significant factor in calculating a phosphorus budget. However, they are one of the most difficult parts of the budget to undertake. Accumulating storm event data can be costly; automatic equipment to sample and record flows must be purchased and operated. Nonetheless, the expense is justified if an accurate phosphorus budget is to be developed. Dennis, 1986, estimated that the four largest runoff events accounted for 65 percent of the total phosphorus export to a Maine Lake, and a single storm event contributed almost 50 percent of the phosphorus load to that same lake.

Many studies have shown that much of the phosphorus load can occur during the first centimeter of rainfall. A study conducted in a Maine watershed estimates that 69 percent of the phosphorus export occurred during the first centimeter of runoff while 90 percent and 97 percent occurs during the first two cm and three cm respectively.

Because the Highland Lake Outlet station represented actual in-lake concentrations of phosphorus, rather than actual storm impact concentration, this station was not included in the storm event monitoring.

The storm event phosphorus loading data, which includes discharge, phosphorus concentration, and phosphorus export at the time of sampling, is referenced in Appendix VII-3. Phosphorus concentrations varied from station to station and over time (Appendix VII-3). Table VII-3 lists maximum phosphorus concentrations, total phosphorus export after a 360 minute storm period and the loading impact for each tributary station. The maximum storm event phosphorus concentration was measured in Emory Pond Brook (219 ug/L) while the minimum was measured at Three Brooks station (64 ug/L).

The greatest tributary phosphorus loading to Sucker Brook during a 360 minute storm event period occurred in Emory Pond Brook. Figure VII-3 presents

Table VII-3
Storm Event Phosphorus Export Data
for Sucker Brook Tributaries

Station	Maximum Storm P Concentration (ug/L)	Total P export at 360 min. (g)	Loading Impact (P export/time)
Highland Outlet	19	44	0.12
Three Brooks	64	36	0.10
Cilley Hill Brook	147	71	0.20
Emory Pond Brook	219	310	0.80
Bald Hill Brook	169	80	0.22
Apple Farm Brook	112	63	0.17

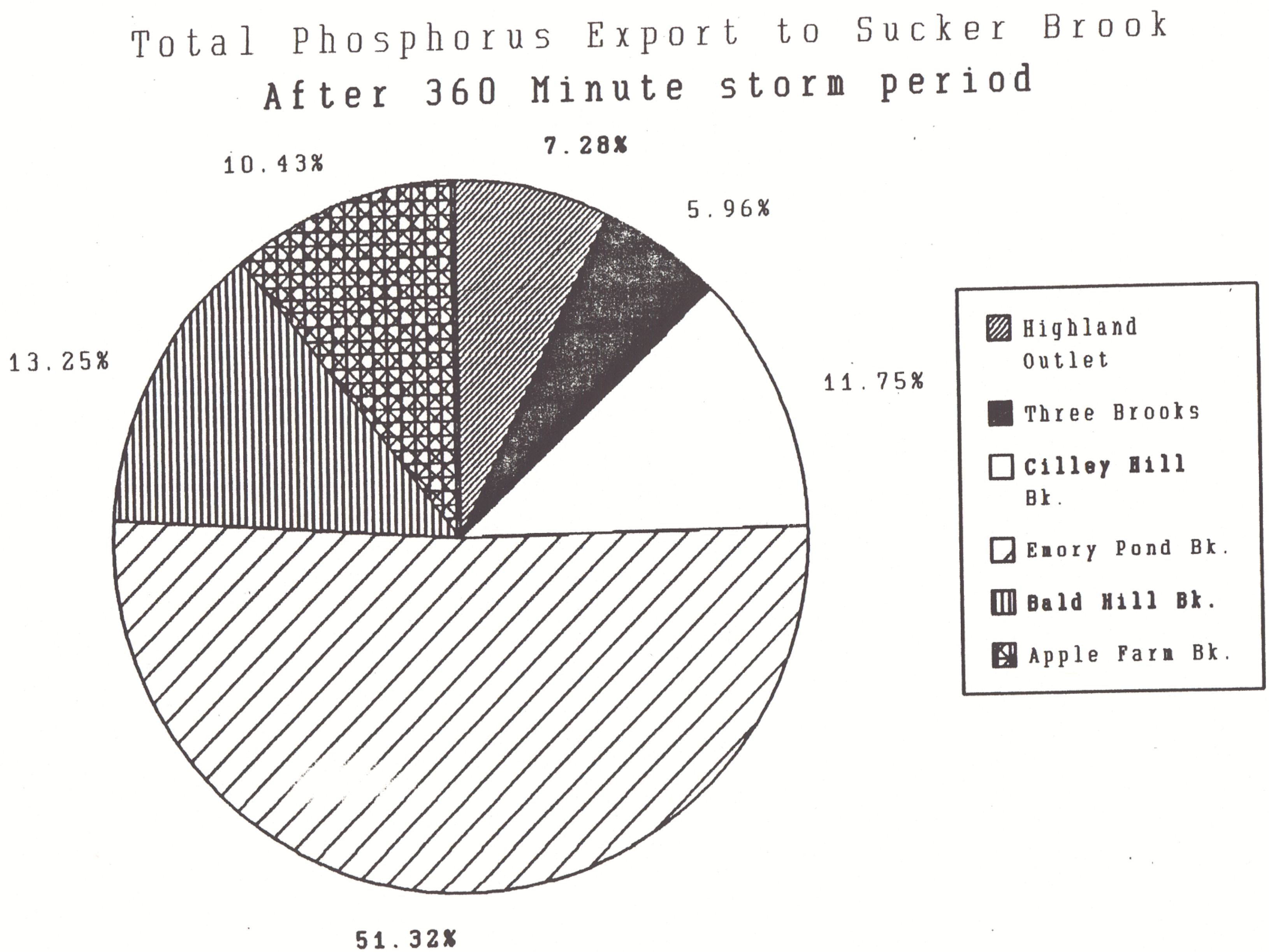

Figure VII-3. Total Phosphorus Export to Sucker Brook from All Tributaries after 360 Minute Storm Period.

the tributary exports during the first 360 minutes of the storm event. Emory (51%), Bald Hill (13%) and Cilley Hill Brooks (12%) were determined to be the greatest contributors of phosphorus to Sucker Brook.

The phosphorus loading impact represents the total tributary phosphorus export per storm sampling period. Again, the loading impact shows Emory, Bald Hill and Cilley Hill Brooks to have the greatest loading impact on Sucker Brook. Table VII-4 shows the storm event phosphorus export data for the Sucker Brook stations. The greatest phosphorus concentration and loading impact was measured at Reep Farm which is located just downstream from Emory Brook, the greatest impact tributary to Sucker Brook.

D. Annual Phosphorus Budgets for Webster Lake

Two phosphorus budgets were prepared for Webster Lake. A normalized or average year budget was constructed based on record mean wetfall (42 inches wetfall) and mean tributary phosphorus concentrations measured during the 1979-80 sample year. A second phosphorus budget was constructed utilizing the measured wetfall for the study year (33 inches wetfall), Sucker Brook phosphorus loading of the 1988 sample season and tributary phosphorus mean concentrations (excluding Sucker Brook) measured during the 1979-80 sample year.

1. Webster Lake Normalized Year Phosphorus Budget

Table VII-5 depicts the phosphorus loading from each of the tributaries to Webster Lake, precipitation, dryfall and septic leachate for the normalized year. Sucker Brook contributes 63 percent (391 Kg) of the phosphorus loading to Webster Lake while the remaining tributaries account for 11%, for a total tributary loading of 74%. Phosphorus from septic systems leaching from the surface or from the groundwater to the lake contributes 11.5 percent (71 Kg) of the total phosphorus budget. The atmospheric phosphorus load to Webster Lake from direct precipitation and dryfall is 14 percent (88 Kg) of the Webster Lake phosphorus budget. These figures are rough estimates since actual groundwater seepage, direct surface runoff and internal phosphorus loading were not estimated and assumed to be minimal inputs.

Figure VII-4 shows the phosphorus loading contributions from each of the calculated categories. The Webster Lake combined tributaries represent over 74 percent (459 Kg) of the entire phosphorus load to the lake.

Table VII-4
Storm Event Phosphorus Export Data
for Sucker Brook

	Maximum Storm P Concentration (ug/L)	Total P export at 360 min(g)	Loading Impact (P export/time)
Highland Outlet	19	44	0.12
Dyers Crossing	79	468	1.3
Reep Farm	102	390	2.7
Webster Inlet	86	490	1.9

Table VII-5
Webster Lake Normalized Year Phosphorus Budget
Phosphorus Loading (kg)

Source	Mean Monthly	Total Annual	Percent of Total
Tributary	38.2	458.7	74.2
Wetfall	5.7	68.1	11.0
Dryfall	1.7	20.4	3.3
Septic Systems	5.9	71.3	11.5
		618.5 kg	

Based on 42 inches of rainfall

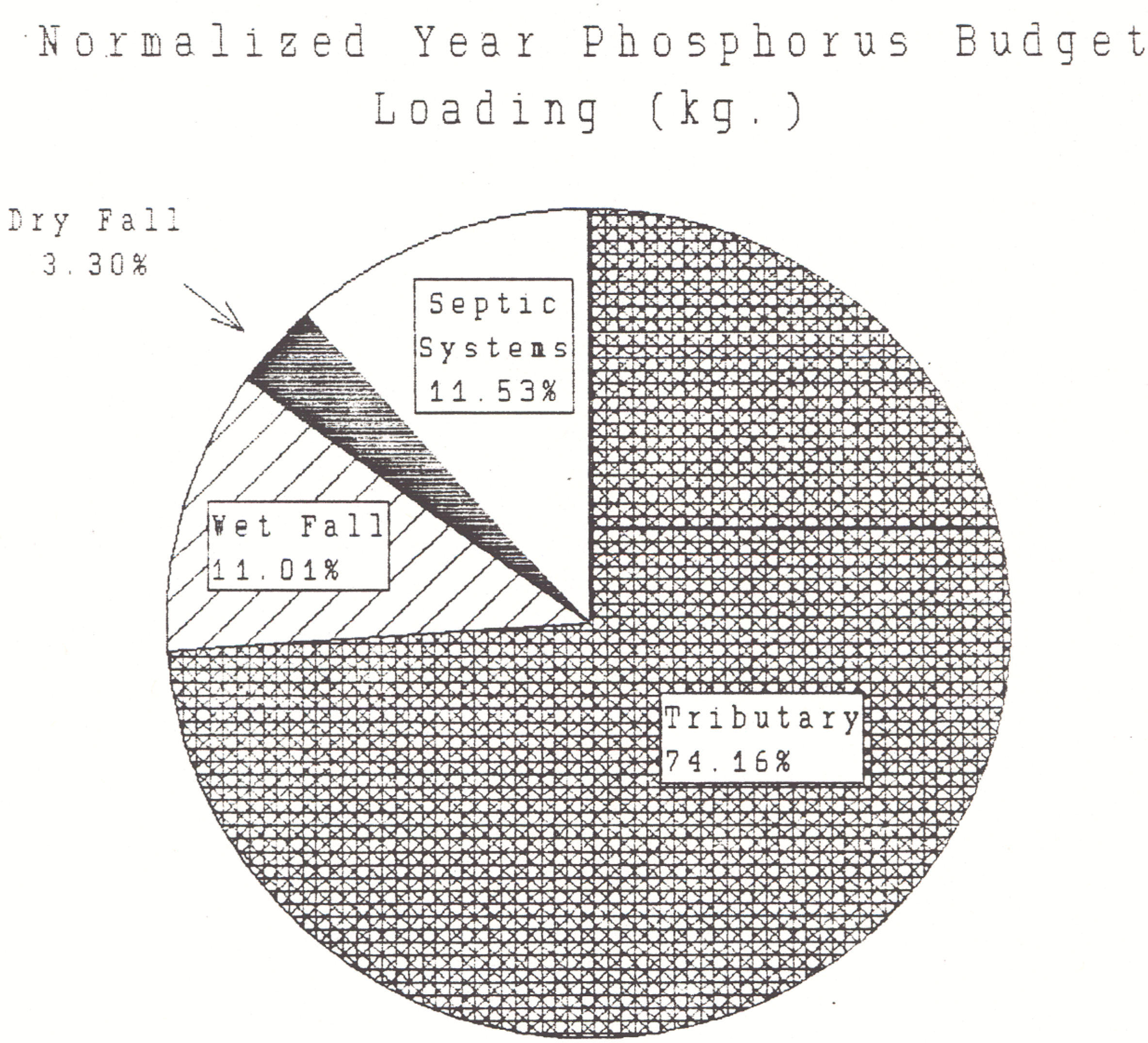

Figure VII-4. Normalized Year Phosphorus Budget.

If only the phosphorus loading from septic leachate is considered as a controllable means to limit phosphorus, at least 87 percent of the total phosphorus load will still enter the lake.

2. Webster Lake Study Year Phosphorus Budget

Tributary mean phosphorus concentrations, phosphorus loading and the percent phosphorus contribution of each tributary to Webster Lake during the study year are presented in Table VII-6. Sucker Brook contributed over 81 percent (265 Kg) of the tributary loading to Webster Lake. The remaining phosphorus load to the lake via other tributaries ranges from only 0.18 percent to 4.2 percent and cumulatively make up less the 19 percent of the total tributary phosphorus load to the lake.

The annual phosphorus budget (1988 study year, Figure VII-5) reveals that 75 percent (326 Kg) of the phosphorus loading is contributed via Sucker Brook. The normalized budget year contributed 133 Kg more phosphorus than the 1988 study year. The calculated septic system load based on the 1981 study was responsible for the addition of 16 percent (71 Kg) of the phosphorus budget.

The phosphorus outflux from the lake was interpolated based on the calculated normalized flow at the outlet, normalized Sucker Brook flow, actual 1988 Sucker Brook flow and mean 1988 epilimnetic phosphorus concentrations. Table VII-7 reflects that a total of 434 Kg of phosphorus entered Webster Lake while 292 Kg of phosphorus exited the lake at the outlet. Since these figures do not include direct surface runoff and groundwater seepage, the total phosphorus influx is probably underestimated.

These budget figures suggest that the net accumulating phosphorus in the lake during the study year is in excess of 142 Kg of phosphorus. Lakes that accumulate phosphorus, such as Webster, are considered sinks. These lakes often supply an additional source of internal phosphorus loading to the hypolimnion during the summer months. This internal phosphorus source is mixed throughout the water column in the fall and is utilized for algal production in the spring and summer.

Evidence of the internal phosphorus loading to the lake from the sediments can be documented by observing the increase of hypolimnetic phosphorus over time.

Table VII-6
Tributary Phosphorus Loading
to Webster Lake during Study Year

Tributary	Flow Volume (10^3m^3)	Mean P Conc (mg/L)	P Load (Kg)	% of Total
1	70.68	0.008	0.57	.18
2	194.63	*0.014	2.72	.84
3	301.36	*0.014	4.22	1.30
4	158.75	0.006	0.95	.29
5	638.59	0.005	3.19	.98
6 Sucker Brook	18,477.00	0.012	265.39	81.50
7	1,246.69	0.011	13.71	4.21
8	240.71	0.012	2.89	.89
9	177.59	0.043	7.64	2.34
10	603.61	0.013	7.85	2.41
11	638.59	*0.014	8.94	2.74
12	124.67	*0.014	1.74	.53
13	52.11	*0.014	0.73	.22
13A	33.54	*0.014	0.47	.14
13B	52.11	*0.014	0.73	.22
14	194.63	0.020	3.89	1.19
Totals	23,205.66		325.63	

*Unsampled Tributary: Median Phosphorus concentration of all tributaries was used to calculate load

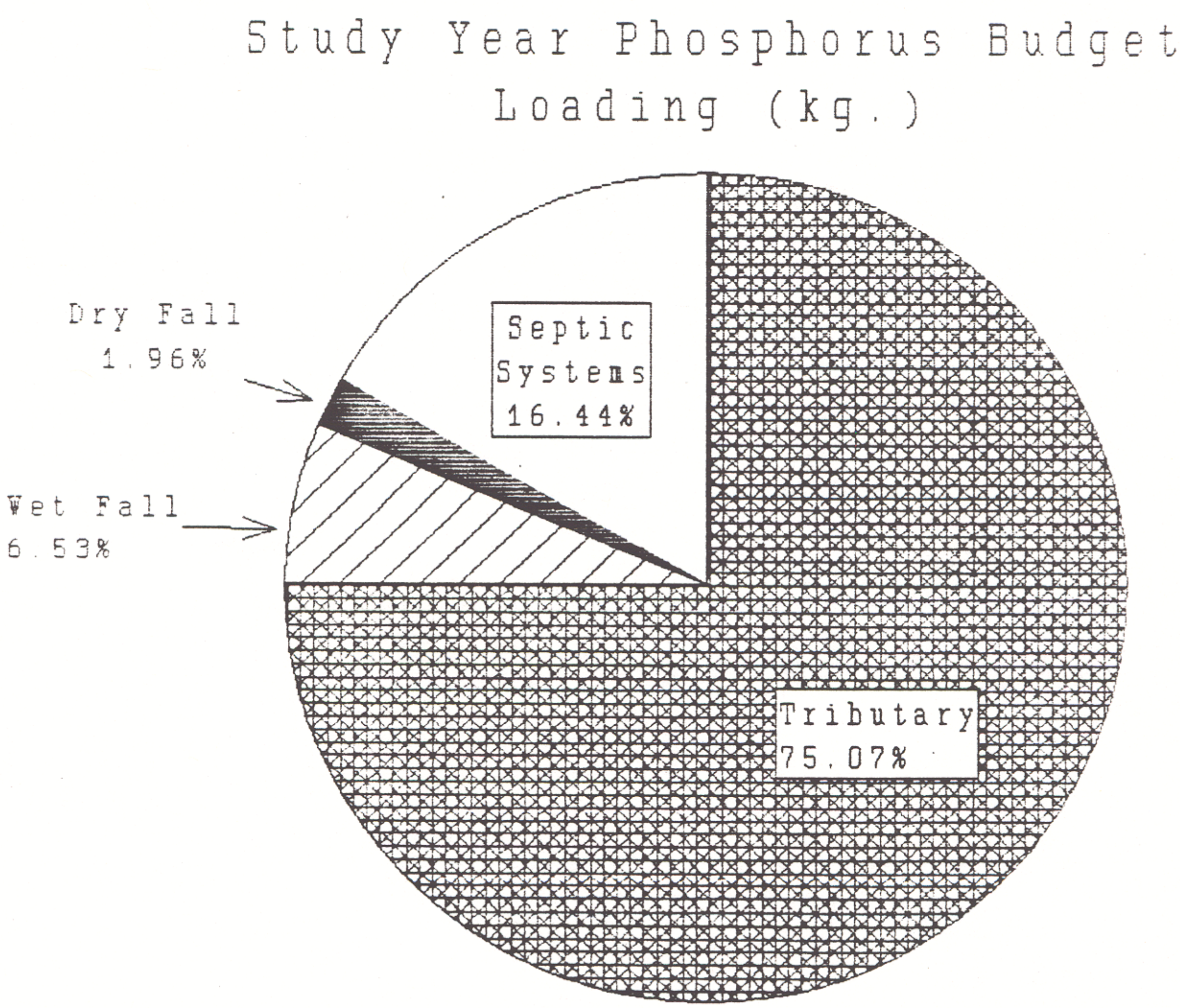

Figure VII-5. Study Year (1988) Phosphorus Budget.

Table VII-7
Webster Lake Study Year Phosphorus Budget
Phosphorus Loading (Kg)

Source	Total Annual	Percent of Total
Tributary	325.6	75.1
Wetfall (0.85m)	28.3	6.5
Dryfall (30%-wet)	8.5	2.0
Septic Systems	71.3	16.4
Total	433.7 Kg	100.0%
*interpolated outflux through outlet	291.7 Kg	
Webster Lake phosphorus retention	142.0 Kg	32.7%

*Outflux was calculated based on normalized flow at outlet, normalized flow at Sucker Brook, actual 1988 flow of Sucker Brook and mean 1988 epilimnetic phosphorus concentration.